CLAIMS

What is claimed is:

1. A method of testing optical fibers, the method comprising:

providing at least two optical fibers;

transmitting a light at a first end of the at least two optical fibers;

measuring a light transmission time for each of the at least two optical fibers;

determining a difference in the light transmission times for the at least two optical fibers;

determining whether the difference in light transmission times is above a predetermined value; and

if the difference in the light transmission times is above the predetermined value, adjusting an amount of optical material forming at least one of the at least two optical fibers to reduce the difference in the light transmission times.

2. The method of claim 1, further comprising assembling the at least two optical fibers into a fiber optic cable.

3. The method of claim 1, wherein the step of transmitting light comprises transmitting light having a predetermined wavelength.

4. The method of claim 1, further comprising optically connecting a light signal generator to the first end of the at least two optical fibers.

5. The method of claim 1, further comprising optically connecting an optical detector to a second end of the at least two optical fibers.

6. The method of claim 1, further comprising optically connecting a second end of each of the at least two optical fibers to an optical detector.

7. The method of claim 1, wherein the step of adjusting the amount of optical material comprises determining a length of an optical fiber segment to be added to one of the at least two optical fibers having a relatively shorter light transmission time as compared to another of the at least two optical fibers having a longest light transmission time.

8. The method of claim 7, wherein the step of determining a length of an optical fiber segment comprises selecting an optical fiber segment having the same general index of refraction as the one of the at least two optical fibers being adjusted and having a length determined by: $X = (L / TT) \cdot \Delta T$ wherein:

X is the length of the optical fiber segment to be added to the one of the at least two optical fibers being adjusted;

L is the length of the one of the at least two optical fibers being adjusted;

TT is the light transmission time of the one of the at least two optical fibers being adjusted; and

ΔT is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and the another of the at least two optical fibers having a longest light transmission time.

9. The method of claim 7, wherein the step of adjusting the amount of optical material comprises selecting a material for the optical fiber segment having a different index of refraction from the at least one of the at least two optical fibers being adjusted.

10. The method of claim 9, wherein the length of the optical fiber segment to be added to the one of the at least two optical fibers is determined by $X = c \cdot n_2 \cdot \Delta T$ wherein:

X is the length of the optical fiber segment to be added to the one of the at least two fibers being adjusted;

c is the velocity of light in a vacuum;

f is the frequency of the light transmitted to the one of the at least two optical fibers being adjusted;

n_2 is the group index of refraction of the optical fiber segment; and

ΔT is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and the another of the at least two optical fibers having a longest light transmission time.

11. The method of claim 9, further comprising selecting the optical fiber segment for which the quantity L_2/TT_2, as measured using light having the same characteristics as that used to determine the light transmission times for the at least two optical fibers, is known such that the length of the optical fiber segment to be added to the one of the at least two optical fibers being adjusted is determined by: $X = (L_2/TT_2) \cdot \Delta T$ wherein:

X is the length of the optical fiber segment;

L_2 is a length of the optical fiber segment when the optical fiber segment is measured to determine the quantity L_2/TT_2;

TT_2 is the light transmission time of the optical fiber segment when the optical fiber segment is measured to determine the quantity L_2/TT_2; and

ΔT is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and the another of the at least two optical fibers having a longest light transmission time.

12. The method of claim 9, wherein the step of adjusting the amount of optical material includes locating an anti reflective coating between the one of the at least two optical fibers being adjusted and the optical fiber segment.

13. The method of claim 1, wherein the step of adjusting the amount of optical material comprises determining a length of optical fiber to be removed from one of the at least two optical fibers having a relatively longer light transmission time as compared to another of the at least two optical fibers having the shortest light transmission time.

14. The method of claim 13, wherein the length of optical fiber to be removed from one of the at least two optical fibers is determined by: $X_R = (L / TT) \cdot \Delta T_2$ wherein:

X_R is the length to be removed from the one of the at least two optical fibers;

L is the length of the one of the at least two optical fibers being adjusted;

TT is the light transmission time of the one of the at least two optical fibers being adjusted; and

ΔT_2 is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and another of the at least two optical fibers having a shortest light transmission time.

15. A method of testing a fiber optic cable, the method comprising:

providing a fiber optic cable having a first and second end, the fiber optic cable comprising at least two optical fibers;

transmitting light at the first end of the fiber optic cable;

measuring a light transmission time for the light to travel through each of the at least two optical fibers of the fiber optic cable;

determining a difference in the light transmission times for the at least two optical fibers of the fiber optic cable; and

determining whether the difference in the light transmission times is above a predetermined value.

16. The method of claim 15, further comprising the step of if the difference in the light transmission times is above the predetermined value, adjusting an amount of optical material of at least one of the at least two optical fibers to reduce the difference in the light transmission times present in the fiber optic cable.

17. The method of claim 16, wherein the step of transmitting light comprises transmitting light having a predetermined wavelength.

18. The method of claim 16, further comprising optically connecting a light signal generator to the first end of the fiber optic cable.

19. The method of claim 16, further comprising optically connecting an optical detector to the second end of the fiber optic cable.

20. The method of claim 16, further comprising optically connecting each of the optical fibers to an optical detector.

21. The method of claim 16, wherein the step of adjusting the amount of optical material comprises determining a length of an optical fiber segment to be added to one of the at least two optical fibers having a relatively shorter light transmission time as compared to another of the at least two optical fibers having the longest light transmission time.

22. The method of claim 21, wherein the step of determining a length of the optical fiber segment comprises selecting an optical fiber segment having the same general index of refraction as the one of the at least two optical fibers being adjusted and having a length determined by: $X = (L / TT) \cdot \Delta T$ wherein:

X is the length of the optical fiber segment to be added to the one of the at least two optical fibers being adjusted;

L is the length of the one of the at least two optical fibers being adjusted;

TT is the light transmission time of the one of the at least two optical fibers being adjusted; and

ΔT is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and the another of the at least two optical fibers having a longest light transmission time.

23. The method of claim 21, wherein the step of adjusting the amount of optical material comprises selecting an optical fiber segment having a different index of refraction from that of the one of the at least two optical fibers being adjusted.

24. The method of claim 23, wherein the length of the optical fiber segment to be added to the one of the at least two optical fibers is determined by $X = c \cdot n_2 \cdot \Delta T$ wherein:

X is the length of the optical fiber segment to be added to the one of the at least two optical fibers being adjusted;

c is the velocity of light in a vacuum;

f is the frequency of the light transmitted to the one of the at least two optical fibers being adjusted;

n_2 is the group index of refraction of the optical fiber segment; and

ΔT is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and the another of the at least two optical fibers having a longest light transmission time.

25. The method of claim 23, further comprising selecting the optical fiber segment for which the quantity L_2/TT_2, as measured using light having the same characteristics as that used to determine the light transmission times for the at least two optical fibers, is known such that the length of the optical fiber segment to be added to the one of the at least two optical fibers is determined by: $X = (L_2/TT_2) \cdot \Delta T$ wherein:

X is the length of the optical fiber segment to be added to the one of the at least two optical fibers being added;

L_2 is a length of the optical fiber segment when the optical fiber segment is measured to determine the quantity L_2/TT_2;

TT_2 is the light transmission time of the optical fiber segment when the optical fiber segment is measured to determine the quantity L_2/TT_2; and

ΔT is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and the another of the at least two optical fibers having a longest light transmission time.

26. The method of claim 16, wherein the step of adjusting the amount of optical material comprises determining a length of optical fiber to be removed from the one of the at least two optical fibers having a relatively longer light transmission time as compared to another of the at least two optical fibers having the shortest light transmission time.

27. The method of claim 26, wherein the length of optical fiber to be removed from the at least one of the at least two optical fibers is determined by: $X_R = (L / TT) \cdot \Delta T_2$ wherein:

X_R is the length to be removed from the one of the at least two optical fibers;

L is the length of the one of the at least two optical fibers being adjusted;

TT is the light transmission time of the one of the at least two optical fibers being adjusted; and

ΔT_2 is the time difference between the light transmission time of the one of the at least two optical fibers being adjusted and another of the at least two optical fibers having a shortest light transmission time.